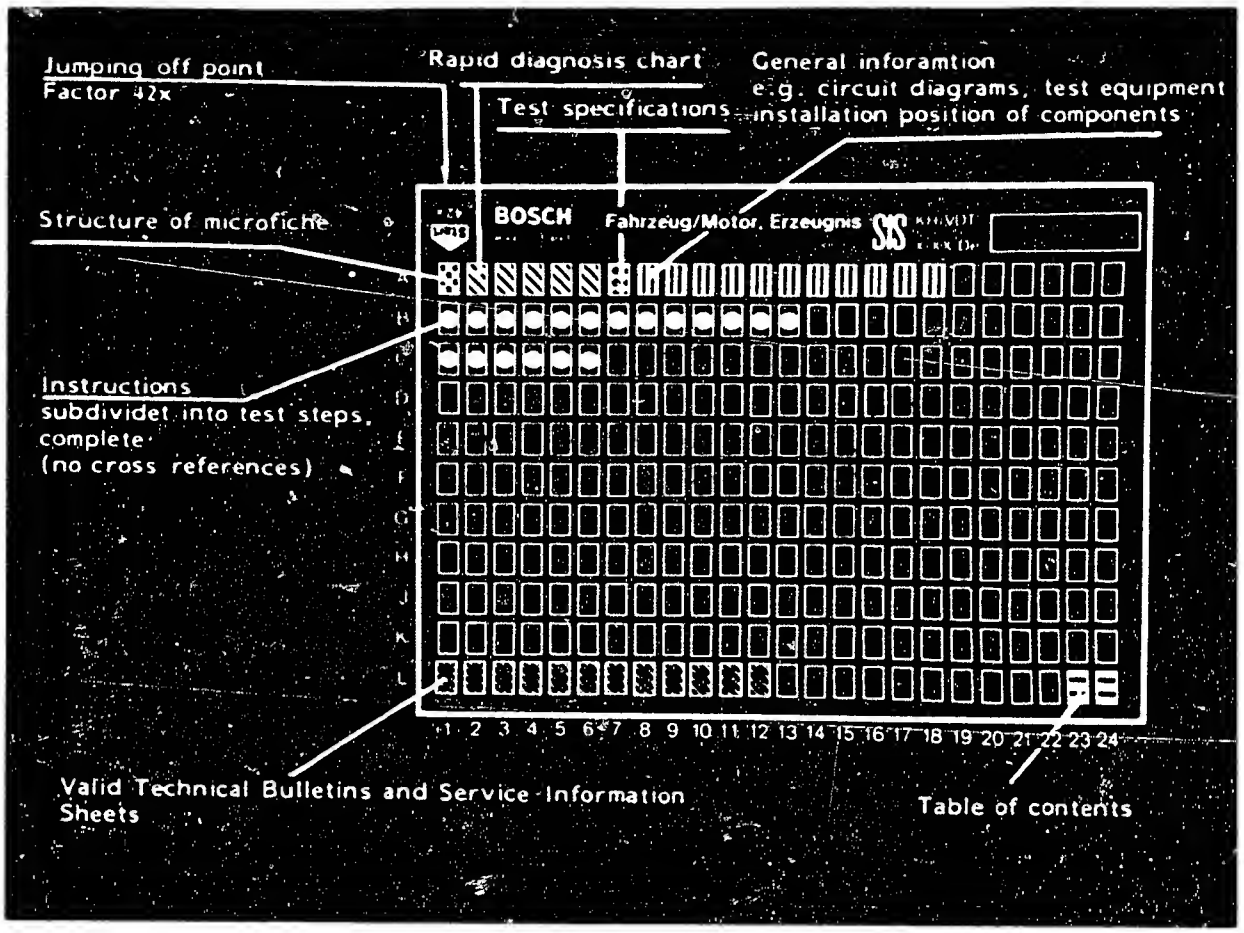
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

1. Rapid diagnosis chart

The following rapid diagnosis chart makes it possible for the experienced expert to quickly check the electrical/electronic part of the ignition system using normal workshop test equipment.

The rapid diagnosis chart contains the following information:

- Customer complaint
- Cause of the trouble
- Test instructions (if no coordinate given on the right, further possibilities for testing are indicated).
- Coordinates for detailed trouble-shooting.

If detailed information and instructions on trouble-shooting are necessary, always proceed according to the trouble-shooting program starting on coordinate B 1.

Rapid diagnosis chart

Customer complaint (symptom of trouble)

1. Starter motor operates, but engine fails to start
2. Rough idling
3. Poor throttle response
4. Engine lacks power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine becomes too hot

1	2	3	4	5	6	7	8	9	Cause of trouble	Test instructions	Coordinates
●	●	●	●	●	●		●		Spark plugs defective	Assess using ignition oscillograms or remove spark plug and make visual examination.	---
●	●	●	●	●	●	●	●	●	Ignition timing incorrect	See Autodata test specifications	---
●	●	●	●	●					Shunt on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram or make visual examination	---
●	●	●	●	●					Open circuit on secondary side	Assess ignition coil, ignition distributor, ignition harness and spark plug using ignition oscillogram, or test for continuity using ohmmeter	
●									Open circuit on primary side	Test voltage supply to trigger box and primary circuit.	C1
●	●	●	●	●					Ignition coil defective	Make visual examination, electrical test.	B5

Rapid diagnosis chart

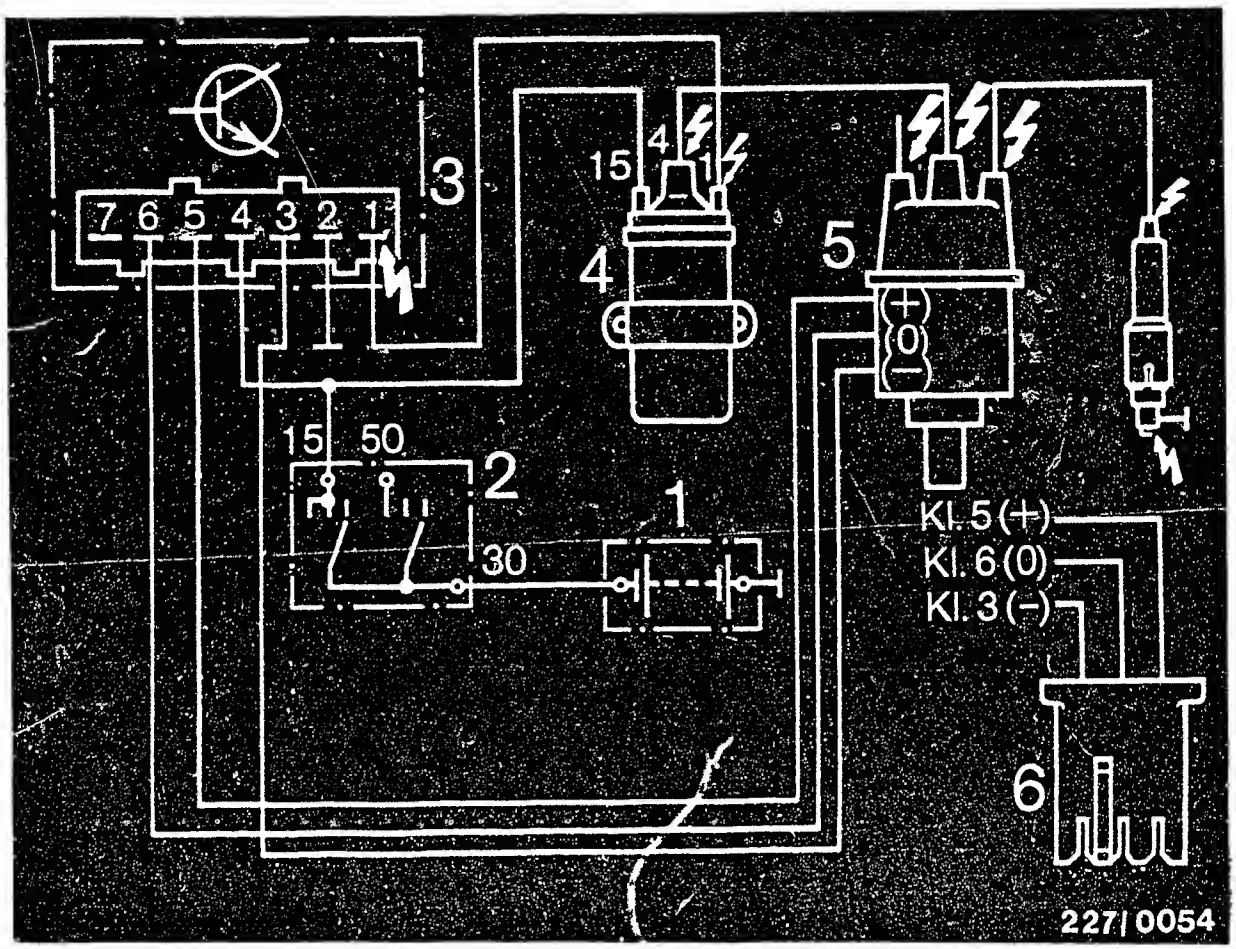
Customer complaint (symptom of trouble)

1. Starting motor operates, but engine fails to start	2. Rough idling	3. Poor throttle response	4. Engine lacks power	5. Misfiring	6. Fuel consumption too high	7. Engine pings when accelerating	8. Backfiring	9. Engine becomes too hot	Cause of trouble	Test instructions	Coordinates
		●	●	●	●				Interference-suppression resistors defective	Assess using ignition oscillogram or perform resistance measurement	-
	●	●	●		●	●	●	●	Centrifugal advance defective	See Autodata test specifications	-
		●	●		●	●		●	Vacuum advance defective	See Autodata test specifications	-
●									Trigger box defective	Test peak-coil-current cut-off, primary voltage.	B11
●									Ignition distributor pickup system defective	Test voltage-supply cable and pickup assembly cable Test voltage supply and operation of magnetic pickup assembly	C5 C7 C9
●	●	●	●	●					Engine-speed limiter defective	Test cut-out speed, or perform visual examination.	
●									Firing sequence incorrect	See Autodata test specifications	

2. Test Specifications

Ignition-coil, primary	0.6 ... 0.9Ω	**B5**
Ignition-coil, secondary	6.3 ...9.2kΩ	
Voltage supply Trigger box	12 ... 14 V	**B9**
Voltage supply Ignition coil	10 V	
Peak-coil current switch-off approx. 1 s After 1 s	 approx. 5 V 0 V	**B11**
Voltage supply Ignition vane switch max.	1...3.5 V less than U_B	**C7**

For adjustment specifications on ignition, idle speed, exhaust gas and valve clearances etc., refer to the Autodata Test Specifications.

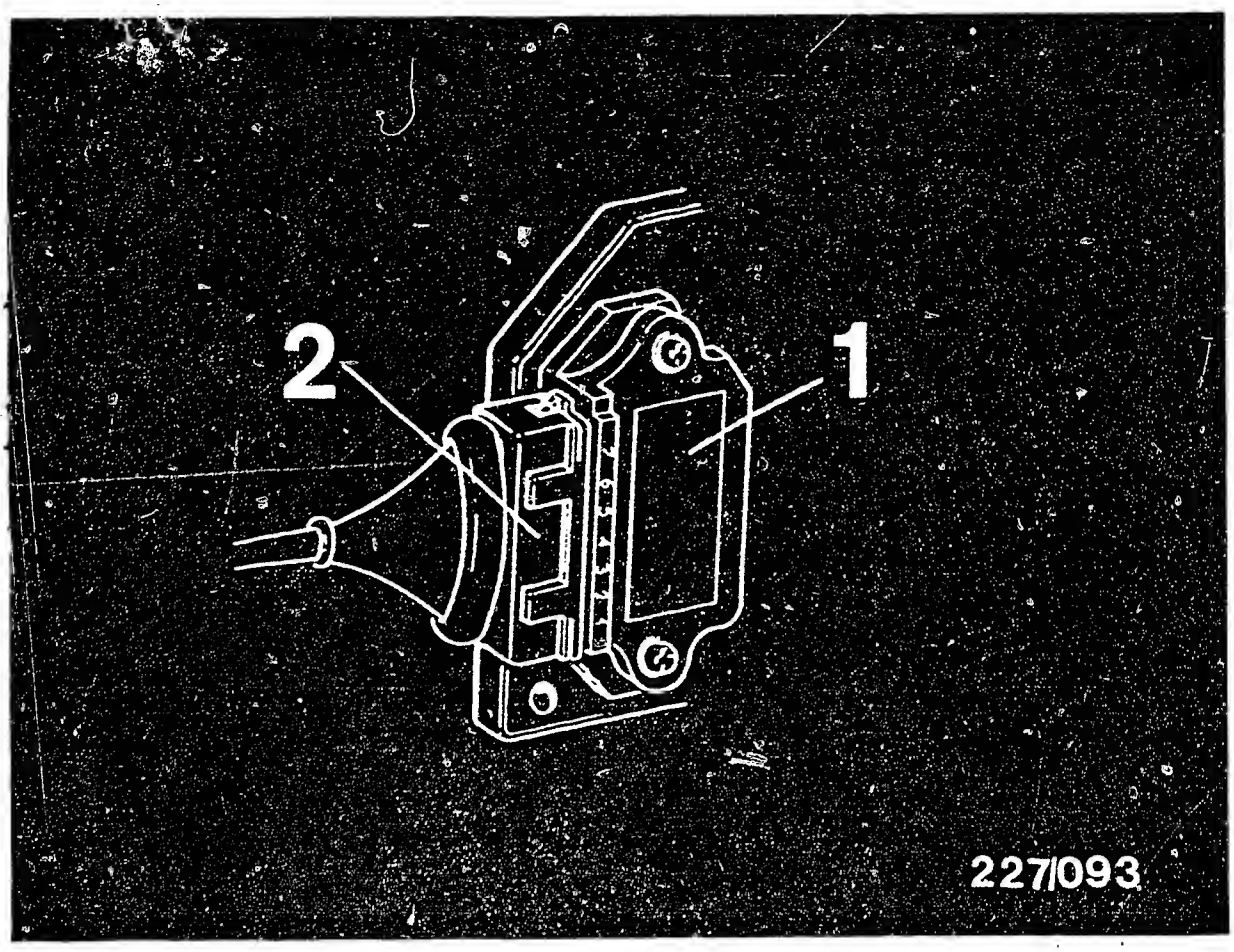


1 = Battery
2 = Ignition and starting switch
3 = Trigger box
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector

Kl. = Terminal

= Dangerous voltages (400 V - 25 kV)

3. Electrical terminal diagram



1 = TI-H trigger box
2 = Trigger-box plug with rubber cap

4. Installation position of the components

The trigger box is located in the engine-compartment (near the battery).

5. Necessary test equipment, aids

Motortester e.g.	MOT 2.01	0 684 000 201
Spark gap e.g.		
Ignition-coil and condenser tester or	EFAW 106 A	0 681 100 001
Single spark gap	EF 1177/7	1 684 531 000
5 kΩ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e.g.	Pontavi Wh2	Commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Heat-conducting paste		5 942 860 003
Test prods		Commercially available

6. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts or terminals are touched (both on the primary as well as the secondary sides).

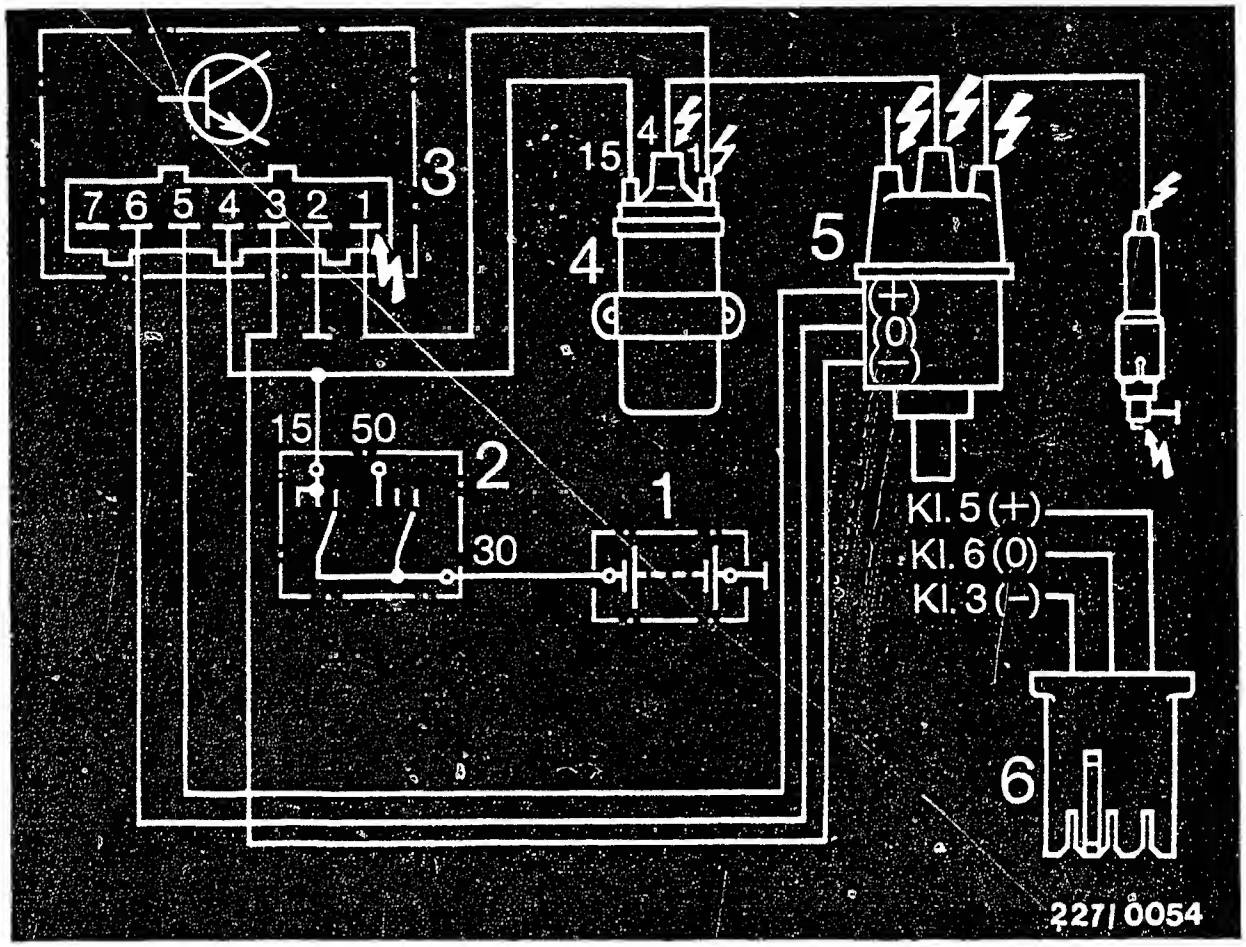
In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope, etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, H.T. ignition cable, etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. carburettor), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.



Kl. = Terminal

1 = Battery
2 = Ignition and starting switch
3 = Trigger box
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector

= Dangerous voltages (400 V - 25 kV)

Electrical terminal diagram

The dangerous locations are marked with danger arrows taking the example of the terminal diagram of an electronic ignition system.

7. Incorrect indication of engine speed, dwell angle and ignition point

In ignition systems with trigger boxes 0 227 022 118 (TI-h) with current limitation there may be an incorrect indication of engine speed, dwell angle and ignition point on testers.
For further details see Coordinates L 8 - L 12

8. Important vehicle information

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).

- When testing compression, remove the trigger-box plug or firmly ground ignition coil terminal 4 using auxiliary cable (dangerous high voltage, insulation damage to ignition coil, ignition distributor, ignition harness).

  Note: Auxiliary cable must have at least 2 kΩ interference suppression, e.g. sleeve-type suppressor (5 kΩ) 0 356 500 001.

- The ignition coil prescribed (see part number) must not be replaced by a different ignition coil.

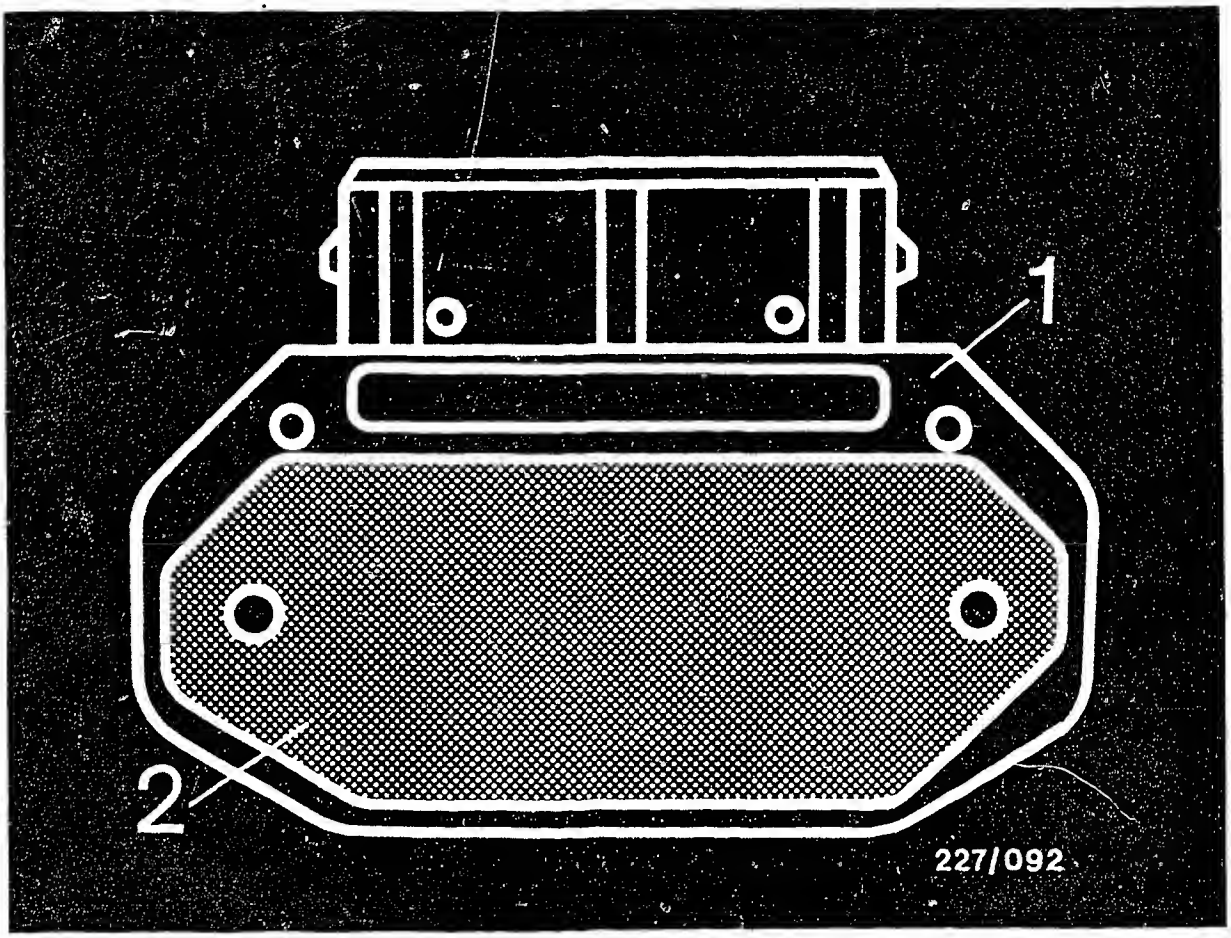
- No suppression capacitor may be connected to ignition coil terminals 1 and 15.

- Ignition coil terminal 1 must not be connected to ground (when ignition is switched on, the ignition coil will be destroyed).

- Neither the positive battery terminal nor a test lamp may be connected to ignition coil terminal 1 (otherwise the trigger box will be destroyed).

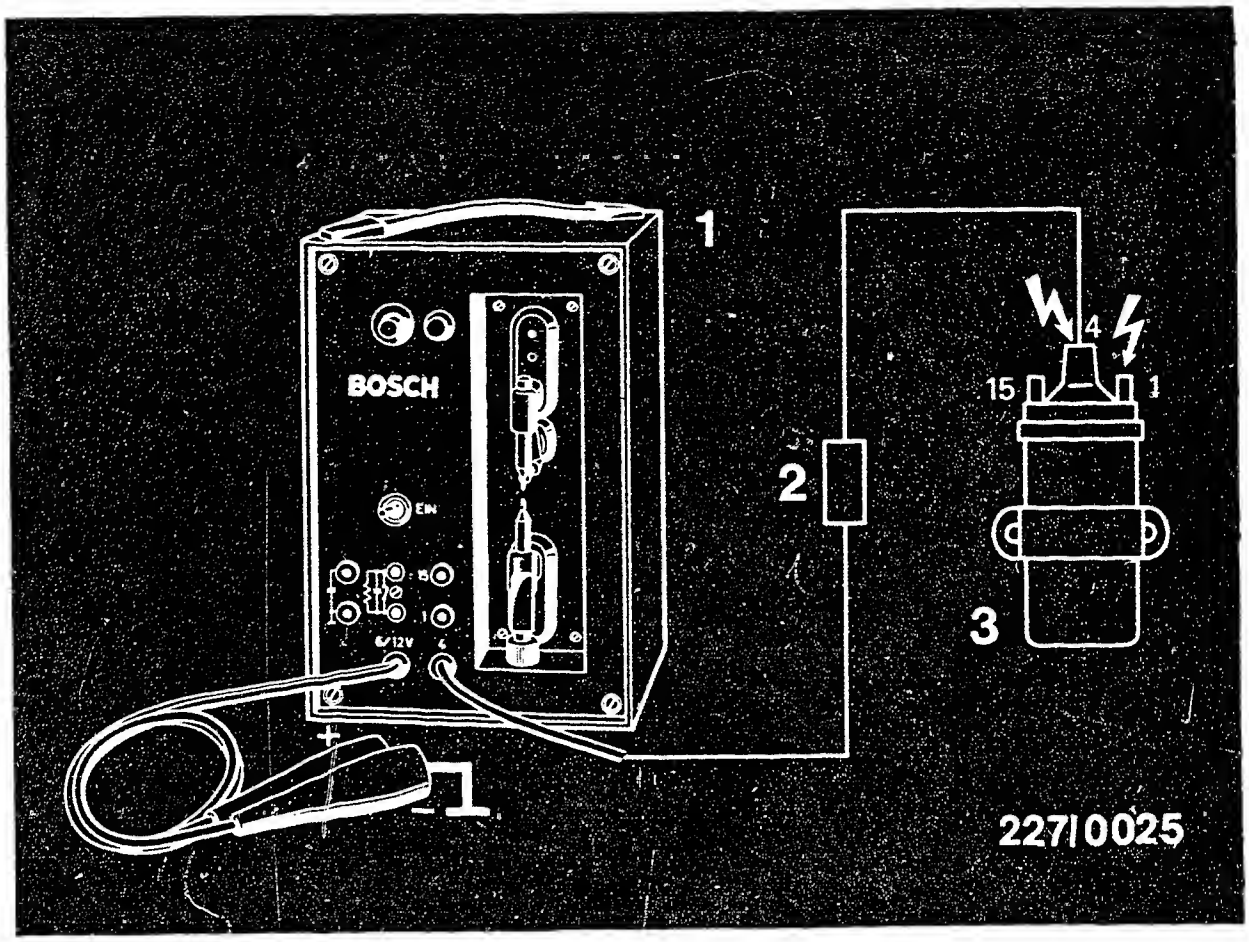
- The ignition cable from ignition coil terminal 4 to ignition distributor terminal 4 must not be disconnected during operation.

- There must be no current discharges from ignition coil terminal 4 to ignition coil terminals 1 and 15. Ignition-vane switch and trigger box can be destroyed.



1 = Trigger box
2 = Base plate

- Before the trigger box is fitted, its base plate must be coated with thermal conduction paste. Only use an appropriate object to apply the paste (screwdriver, matchstick etc.).
  Thermal conduction paste is not to come into contact with painted surfaces.



1 = Spark gap
2 = 5 k Ω sleeve-type suppressor
3 = Ignition coil

= Dangerous voltages (400 V - 25 kV)

- In order to prevent the trigger box from being irreparably damaged, when using a spark gap, an interference-suppression resistor of at least 2 k Ω must be connected between the spark gap and ignition coil terminal 4, e.g. sleeve-type suppressor (5 k Ω) 0 356 500 001.

- In the case of ignition distributors with engine-speed limitation the ignition distributor side terminal 4 must have 1 kΩ interference suppression. Operation without interference suppression will lead to the destruction of the trigger box.

- In order to prevent the trigger box from being irreparably damaged, the secondary side of the ignition system must have at least 2 k Ω interference suppression whereby the original distributor rotor with 1 k Ω interference-suppression resistor must be fitted (even in the case of radio and spark interference suppression do not use a 5 k Ω distributor rotor).

- No external voltage, e.g. ohmmeter, must be connected to the ignition distributor magnetic pickup assembly (Hall generator). Caution when switching over measuring ranges.

- The lines from the Hall generator to the trigger box must be laid separately from other lines. There must be at least 100 mm distance between Hall generator lines and the ignition cables and the line from terminal 1 of the trigger box to terminal 1 of the ignition coil (Hall generator will be destroyed).

- The holding springs of the distributor cap must not drop into the pickup system when the engine is being cranked and with the dust-protection cover removed.

- Insulation faults (leakage currents and/or punctures etc.) on the ignition-distributor cap can destroy the trigger box and the magnetic pickup assembly.

- Do not disconnect the battery while the engine is running.

- Incorrect battery polarity will lead to the destruction of the magnetic pickup assembly of the ignition distributor, trigger box and ignition coil.

- Do not use a starting aid with more than 16 V or a fast charger for starting.

9. Trouble-shooting program

Procedure

The trouble-shooting program is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.
The center row contains repair instructions.
The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanation of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "Yes", then proceed to the next test down.

If the answer to the question is "No", branch to the center row and carry out the tests given there.

Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e.g. compression, valve clearance etc.).
Ambient temperature/ignition system temperature 0° to +100°C(temperature has a considerable effect on measured values).

Beginning of trouble-shooting program

Starting motor operates, engine fails to start or misfires or lacks power.

Yes

Continued on B 3

yes

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Primary signal testing with oscilloscope
Connect oscilloscope to ignition coil as per operating instructions.
Start engine.
Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer
Connect tachometer to ignition coil as per operating instructions.
Start engine.
Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap
Remove H.T. ignition cable term. 4 from ignition coil.
Connect spark gap including sleeve-type suppressor (5 kΩ) to ignition coil. Adjust spark gap to 5 mm.
Start engine.
There must be sparks across the spark gap.

Primary signal present or ignition sparks across spark gap?

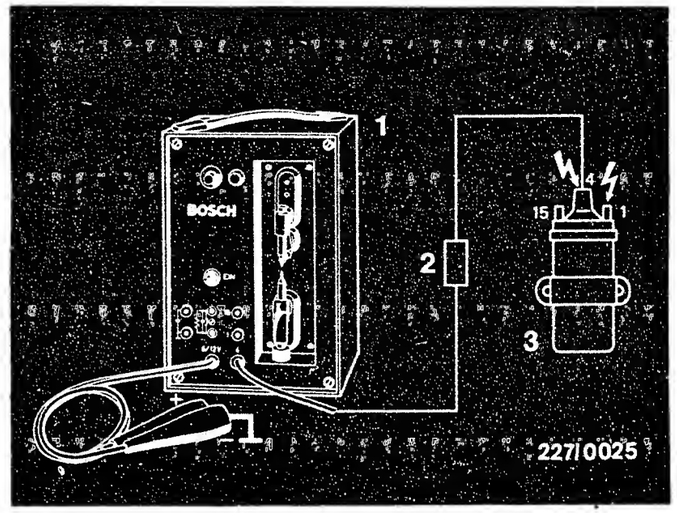
no →

If no primary signal or no ignition spark, continue testing at C 1.

Tests from B 5 onwards not necessary.

yes

Continued on B5/6



1 = Spark gap
2 = 5 kΩ sleeve-type suppressor
3 = Ignition coil

Dangerous voltages
approx. 400 V - 25 kV

yes

Check distributor cap, distributor rotor, H.T. ignition cables and spark plugs

High tension side O.K.?

No → Repair high-tension side.

yes

Test ignition coil.

Visual examination: Remove protective cap from ignition coil and check whether plug is in position and whether any sealing compound has escaped

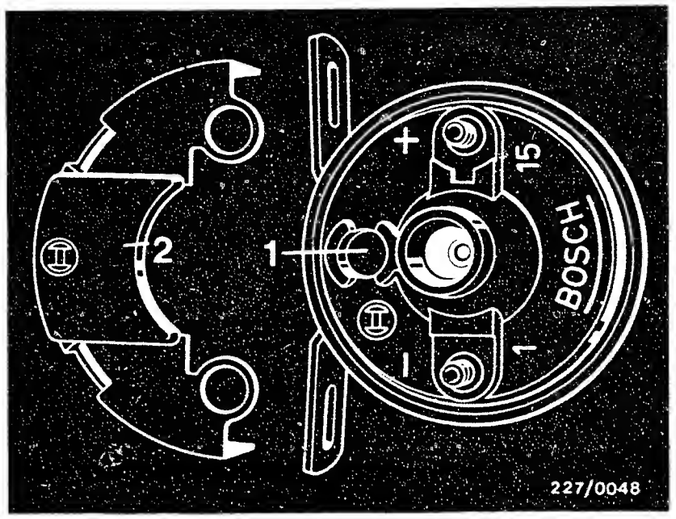
Electrical test:

Ignition coil primary (terminal 15 and 1) 0.6 ... 0.9Ω (take resistance of test lead with test prods into account). Ignition coil secondary (terminals 1 and 4) 6.3 ... 9.2 kΩ.

Plug in position? No sealing compound escaped? Resistance values O.K.?

No →

1. If plug is not in position and/or sealing compound has escaped, replace trigger box and ignition coil.
2. If resistance values are not O.K., replace ignition coil.



1 = Plug
2 = Protective cap

yes

Continued on B 7/8

Yes

Engine running? — No

Disconnect negative and positive cables from battery. Remove trigger-box plug. Switch on ignition.

1. Check for contact resistance in cables from positive battery terminal to trigger-box plug term. 4 including cables from negative battery terminal to trigger-box plug term. 2. Total contact resistance max. 0.3Ω (take resistance of test lead with test prods into account). Eliminate contact resistance.

2. Check for contact resistance in cables from positive battery terminal to ignition coil term. 15 as well as in cable from ignition coil term. 1 to trigger-box term. 1. Total contact resistance max. 0.3Ω (take resistance of test lead with test prods into account). Eliminate contact resistance. If the contact resistance in points 1 and 2 is less than 0.3Ω, replace trigger box.

Yes

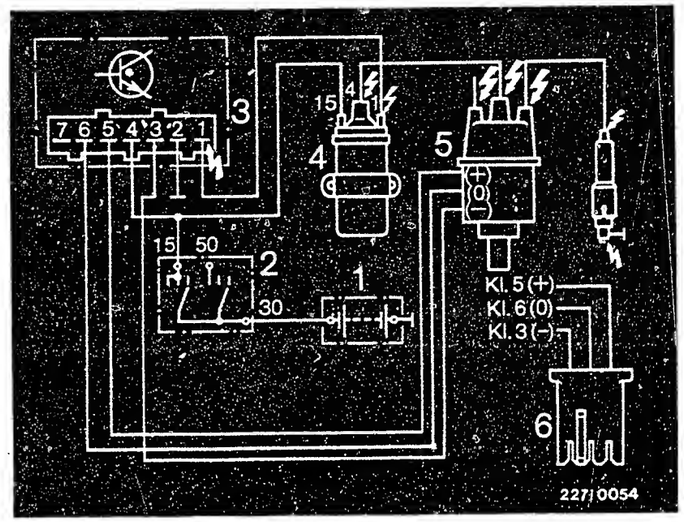
Check initial ignition-timing adjustment (Autodata test specifications).

(If indication of engine speed on tester is clearly incorrect, connect in series resistor/convert motortester).

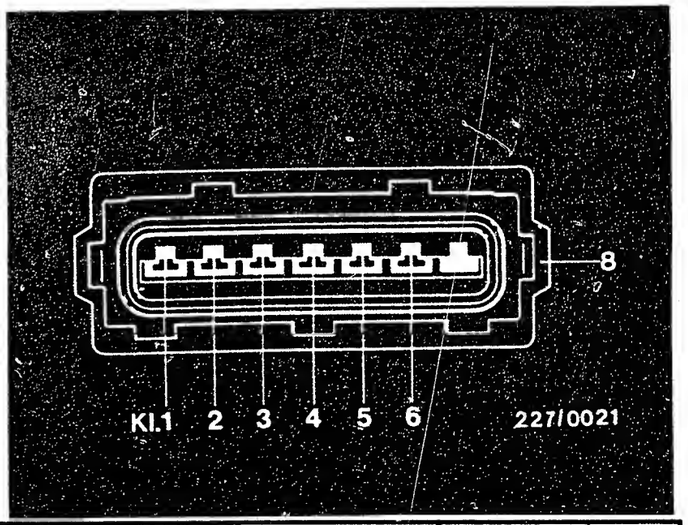
Adjustment correct? — No — Adjust ignition.

Yes

Continued on B 9/10



1 = Battery
2 = Ignition and starting switch
3 = Trigger box
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector
⚡ = Dangerous voltages (400 V - 25 kV)



Yes

Test trigger box voltage supply.
Push back rubber sleeve of trigger-box plug.
Connect voltmeter with test prods to trigger-box plug term. 4 and term. 2.
Let engine idle.
Measured voltage must be 12 ... 14 V and must be no more than 1 V below battery voltage.

Voltage correct?

No →

Disconnect negative and positive cables from battery. Remove trigger-box. Switch on ignition.
1. Check for contact resistance in cables from positive battery terminal to trigger-box plug term. 4 including cables from negative battery terminal to trigger-box plug term. 2. Total contact resistance max. 0.3Ω (take resistance of test lead with test prods into account).
   Eliminate contact resistance.

Yes

Test ignition coil voltage supply.
Connect voltmeter to ignition coil term. 15 and negative battery terminal.
Let engine idle.
Measured voltage must be at least 10 V.

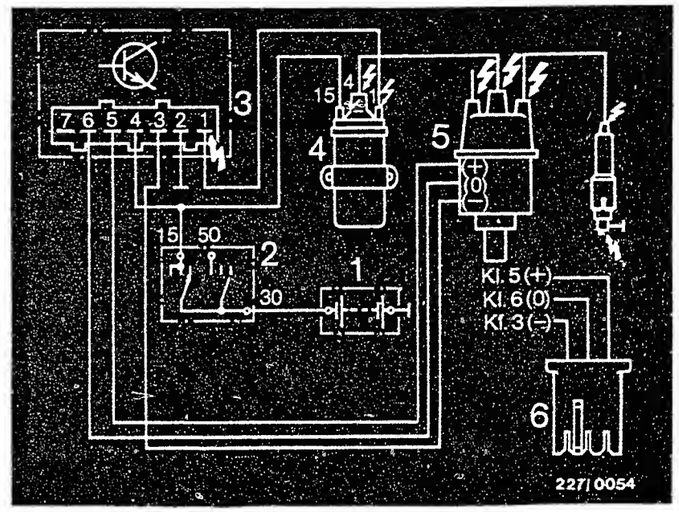
Voltage correct?

No →

Disconnect positive cable from battery.
Switch on ignition.
Check for contact resistance in cables from positive battery terminal to ignition coil term. 15.
Contact resistance max. 0.3Ω (take resistance of test lead with test prods into account).
Eliminate contact resistance.

Yes

Continued on B 11/12



1 = Battery
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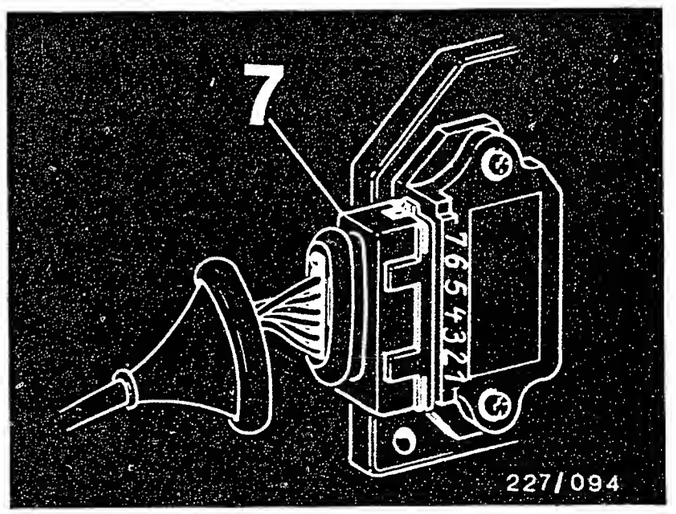
6 = Ignition distributor connector
⚡ = Dangerous voltages (400 V - 25 kV)

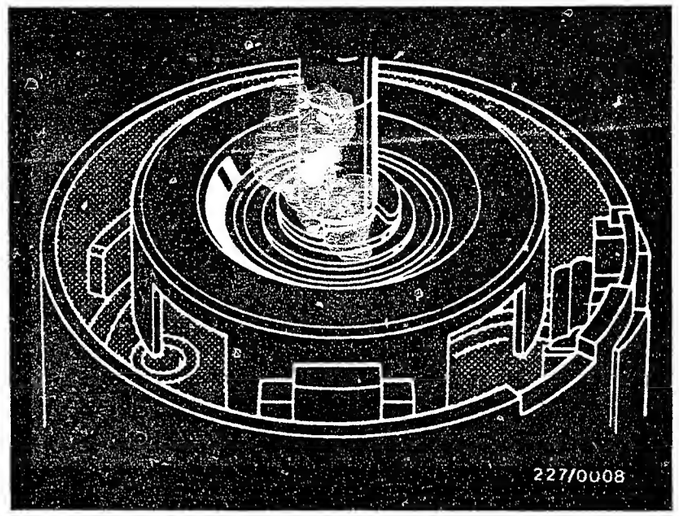


Yes

Test peak-coil-current cut-off. Connect voltmeter to ignition coil term. 15 and term. 1.
Remove distributor cap, distributor rotor and dust-protection cover.
Turn engine over by hand in direction of rotation until vane is completely in air gap of magnetic pickup assembly.
See illustration.
Switch on ignition.
Voltmeter deflects slightly (approx. 5 V) for approx. 1 sec. Voltmeter must return to 0 V.

Voltage (0 V) correct?

No → Replace trigger box and ignition coil.



Continued on B 13

Yes

Ignition system O.K.

Test completed.

Test starting at C1 no longer necessary.

Note:

If customer complaint is not yet remedied, then check for further possible faults in the fuel system, or engine not mechanically O.K.

No primary voltage/no ignition spark.

(Continued from B 3/4)

yes

Test trigger box voltage supply.
Remove trigger-box plug.
Connect voltmeter to trigger-box plug between term. 4 and term. 2.
Switch on ignition.
Voltmeter must indicate battery voltage.

Voltage correct?

No → Check for open circuit in cables and terminals from ignition and starting switch to trigger-box plug term. 4 including ground cable term. 2. Eliminate open circuit.

yes

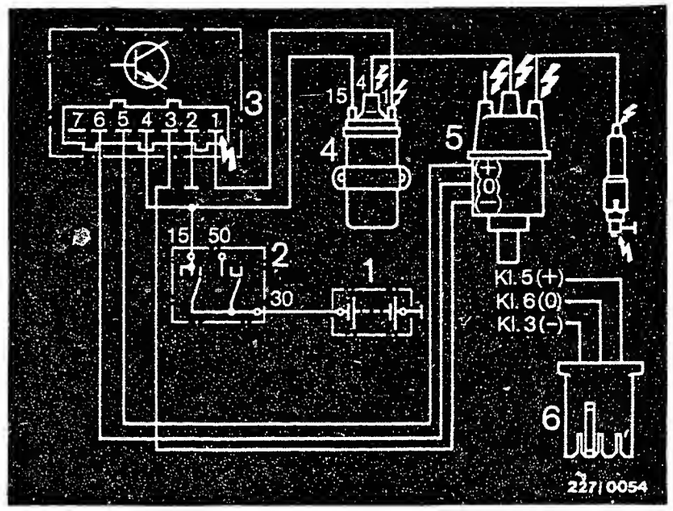
Test primary circuit.
Connect voltmeter to disconnected trigger-box plug between term. 1 and term. 2.
Switch on ignition.
Voltmeter must indicate battery voltage.

Voltage correct?

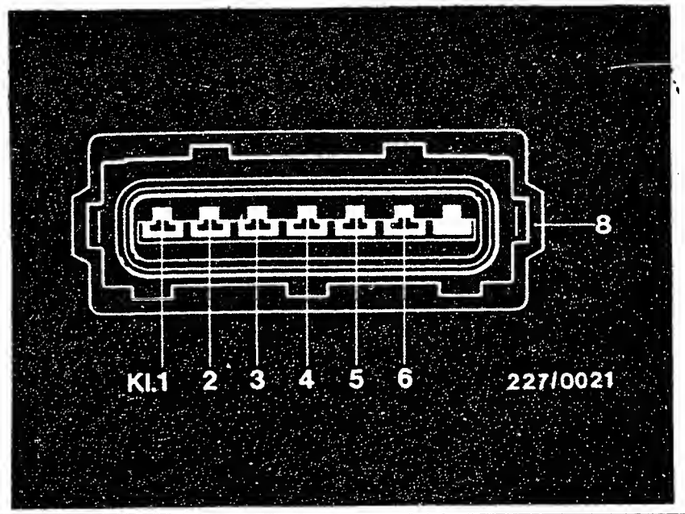
No → Check for open circuit in cable from ignition and starting switch to ignition coil term. 15, primary winding of ignition coil as well as cable from ignition coil term. 1 to trigger-box plug term. 1 including ground cable term. 2. Eliminate open circuit.

yes

Continued on C 3/4



1 = Battery
2 = Ignition and starting switch
3 = Trigger box
4 = Ignition coil
5 = Ignition distributor
6 = Ignition distributor connector
⚡ = Dangerous voltages (400 V - 25 kV)



Yes

Test ignition coil.

Visual examination: Remove protective cap from ignition coil and check whether plug (see illustration) is in position and whether any sealing compound has escaped.

Electrical test: Ignition coil primary (term. 15 and 1) 0.6 ... 0.9Ω (take resistance of test lead with test prods into account).
Ignition coil secondary (term. 1 and 4) 6.3 ... 9.2 kΩ

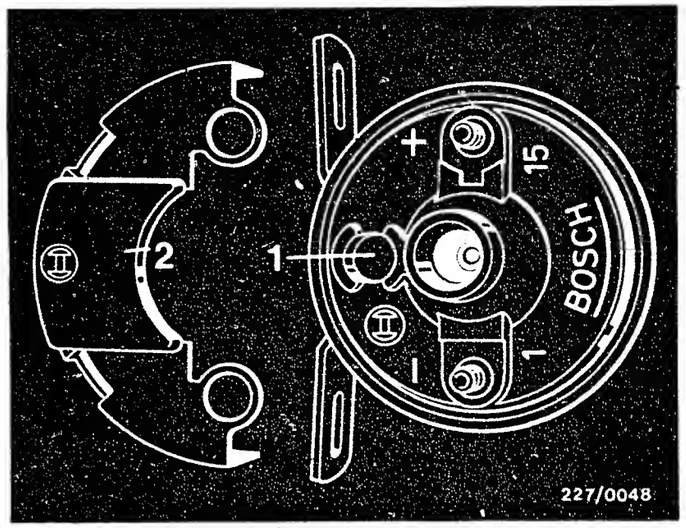
Plug in position? No sealing compound escaped?

Resistance values O.K.?

No →

1. If plug is not in position and/or sealing compound has escaped, replace trigger box and ignition coil:

2. If resistance values are not O.K., replace ignition coil.



1 = Plug
2 = Protective cap

Yes

Continued on C 5/6

Check the voltage supply cable and pickup assembly cable. Pull the 3-pin ignition-distributor connector plug from the socket. Connect the ohmmeter to the following terminal pairs one after the other:

Trigger-box plug		Ignition-distributor connector plug
Term. 5	and	Term. 5 (+)
Term. 6	and	Term. 6 (0)
Term. 3	and	Term. 3 (-)

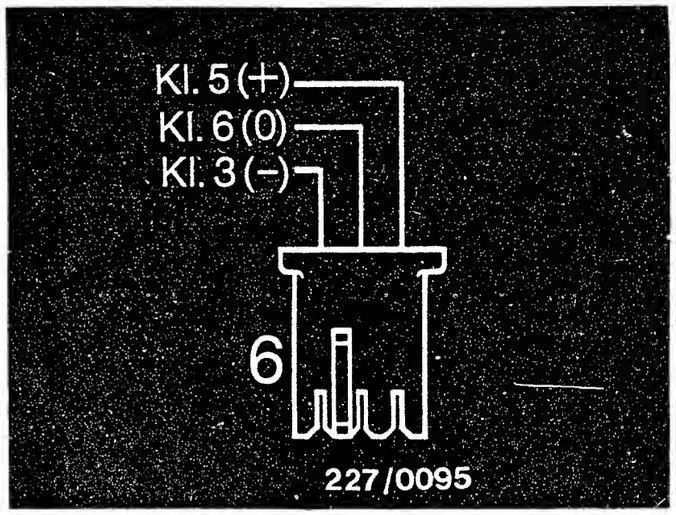
In each case, the ohmmeter must register 0Ω (straight-through reading).

Straight-through reading (0Ω) in the vane-switch lead?

No → Remove open-circuit

Yes

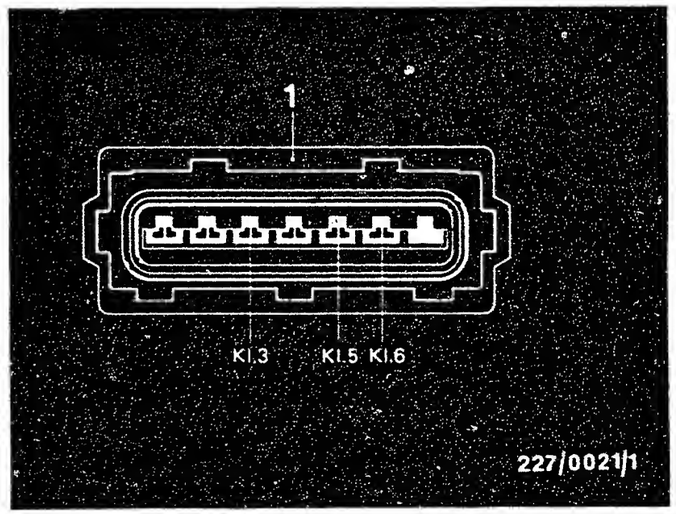
Continued on C 7/8



6 = Ignition distributor

1 = Trigger-box plug

Kl. = Term.



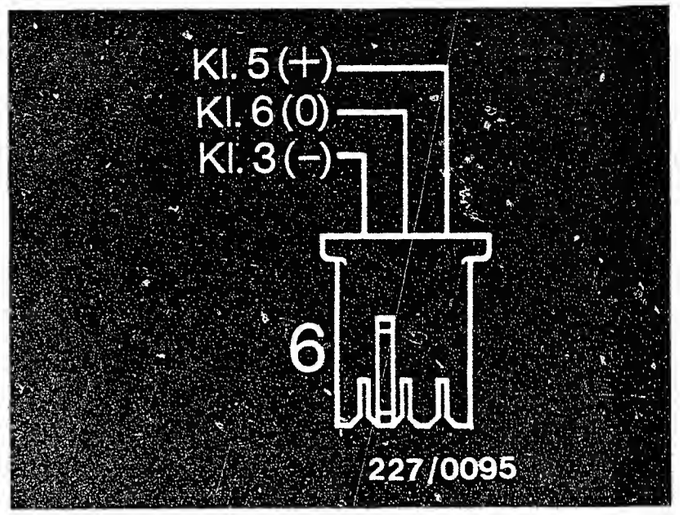
yes

Check the voltage supply from the pickup assembly.

Connect the trigger-box plug and the ignition distributor plug. Push back the rubber sleeve from the ignition distributor plug. Connect the voltmeter with test prods to terminals 5 and 3.
The voltage shown may be 1.0 V to max. 3.5 V below battery voltage.

Voltage value O.K.?

No → Replace trigger box.



Kl. = terminal

6 = Ignition distributor plug

yes

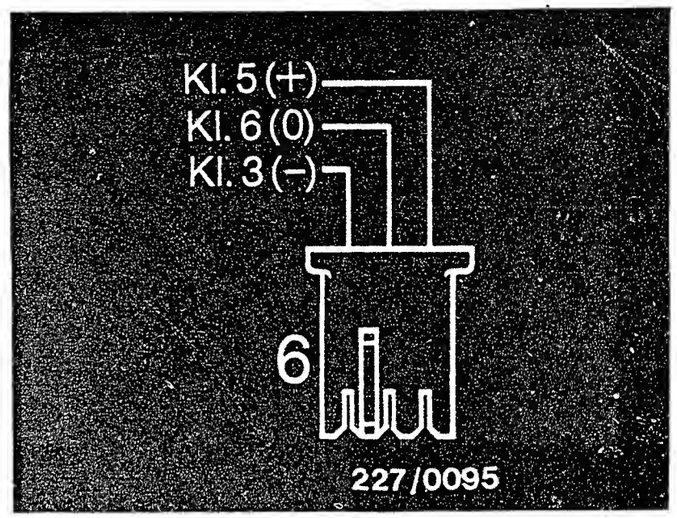
Continued on C9/C10

yes

Check the pickup assembly. Connect the oscilloscope in the program position "Special" according to the operating instructions.
e.g. MOT 201.
Connect red terminal with test prods to ignition distributor plug terminal 6 (measuring signal). Connect the black terminal to vehicle ground. Start the engine. The oscilloscope must show a rectangular impulse. See illustration.

Is there a rectangular impulse?

No → Replace pickup assembly or ignition distributor.



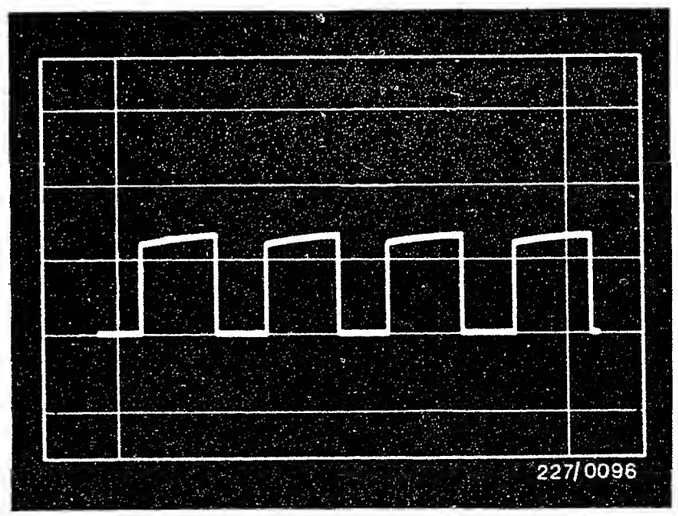
Kl. = terminal

6 = Ignition distributor plug

yes

Replace trigger box.
Test completed.
Test from B5 not necessary.

Please note
If the customer complaint is not yet eliminated, then there are further faults in the fuel system or the engine is not in working order.



After-sales Service

Technical Bulletin

Danger of Accident on Semi-conductor Ignitian Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ogo to manufactures storting to equip their vehicles with semi-canductor ignition systems as original equipment. In most cases the performonce of nearly all makes of such systems is higher than that of conventionol systems, ond further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to paint out to you that the laws valid in your country regarding work on high-voltage systems must be odhered ta when working on, or testing, semi-conductor ignition systems.

As o matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replocement of ignition system parts (spork plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or moke odjustments on the engine (to the carburetor for instance), then lethal voltages ore present throughout the entire system.

This means that the danger of accident exists not only at individuol components in the system (e.g. ignition distributor, ignitian coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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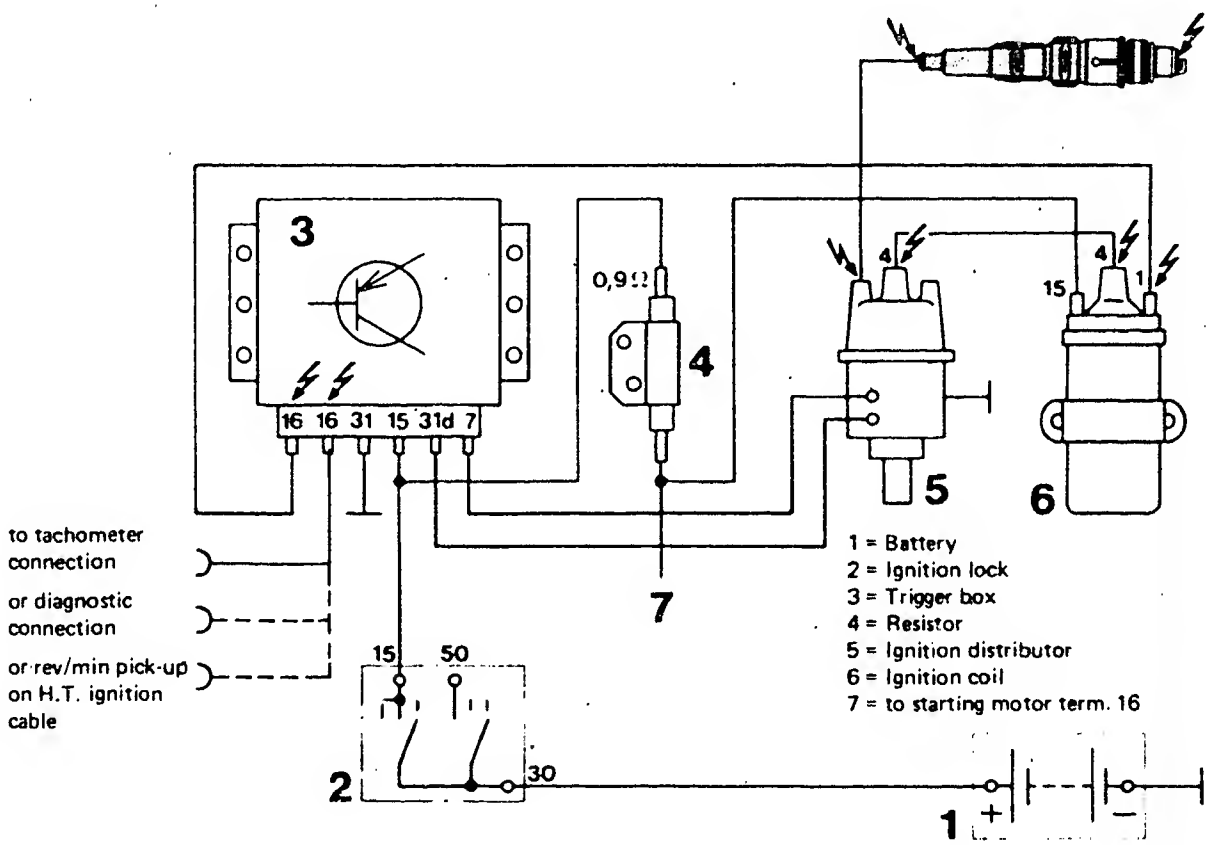
In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

After-sales Service

Technical Bulletin

EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

e.g. ignition systems, Jetronic, Motronic, ABS

VDT-I-227/107 En
1.1981

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).
   Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

After-sales Service

Technical Bulletin

BREAKERLESS TRANSISTORIZED IGNITION SYSTEM 22

Warranty note VDT-I-227/103 En
Hybrid construction trigger boxes 3.1979
0 227 100 100 for ignition distributor
with Hall generator (TCI-h)
0 227 100 102 for ignition distributor
with induction-type
pulse generator (TCI-i)

Apart from the well-known TCI trigger boxes 0 227 100 0.. , trigger boxes of hybrid construction have been fitted as standard since 9.78 (Fig. 1).

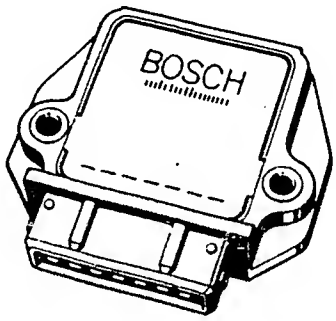

Fig. 1

Warranty procedure.

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GmBH
KH/LAV - Auspackraum

zur Weiterleitung an K1/VAK 21

D-7000 Stuttgart 30

This instruction remains valid until further notice.

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Technical Bulletin

NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En.
5.1981

The introduction of new ignition systems has made it necessary to reclassify all designations.
The designations listed below will be used immediately in KH workshops and in sales literature.

Designation	Abbreviated code	Meaning	Switching part	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	-------	mechanical (breaker points)	mechanical (ignition distributor)	mechanical (ignition distributor)
Transistorized coil ignition	TSZ-k (TCI-c)	k=breaker-triggered	electronic (trigger box)	mechanical (ignition distributor)	mechanical (ignition distributor)
Trigger box with traditional switching techniques	TSZ-I* (TCI-i)	I=induction type pulse generator	electronic (trigger box)	mechanical (ignition distributor)	mechanical (ignition distributor)
	TSZ-H (TCI-h)	H=Hall generator	electronic (trigger box)	mechanical ignition distributor)	mechanical (ignition distributor)
Transistorized ignition	TZ-I* (TI-i)	I=induction type pulse generator	electronic (trigger box)	mechanical (ignition distributor)	mechanical (ignition distributor)
(Trigger box in hybrid technique)	TZ-H* (TI-h)	H=Hall generator	electronic (trigger box)	mechanical (ignition distributor)	mechanical (ignition distributor)

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Designation	Abbreviated code	Meaning	Switching part	Ignition control and spark advance	High-voltage distribution
Electronic ignition	EZ-L	L=characteristic curve	electronic (trigger box or control unit)	electronic (control unit)	mechanical (ignition distributor)
	EZ-F	F=ignition map	electronic (trigger box or control unit)	electronic (control unit)	mechanical (high-voltage distributor)
Distributorless semiconductor ignition	VZ-L	L=characteristic curve	electronic (control unit)	electronic (control unit)	electronic (two-spark ignition coil, or 1 ignition coil/spark plug)
	VZ-F	F=ignition map	electronic (control unit)	electronic (control unit)	electronic (two-spark ignition coil, or 1 ignition coil/spark plug

* Please note: The ignition system can additionally be fitted with a DLS unit (digital idle stabilizer) or with an ELS unit (electronic idle stabilizer) or with an ESV unit (electronic ignition retardation).

After-sales Service

Motor Vehicle Service Information

INCORRECT DISPLAY OF ROTATIONAL SPEED AND DWELL ANGLE ONLY WITH TRIGGER BOXES 0 227 100 ... (TCI-i, TCI-h) WITH CURRENT LIMITATION

VDT-I-Gen. 030 En
6.80
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT	001.00 001.01 001.02 001.04 002.00	Rotational-speed display O.K. with these testers	KTE	001.00 001.02 001.03

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild-ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan-Datsun	(Hitachi ignition system)
Fiat	(Delco ignition system)	Peugeot	(Bosch ignition system)
Ford	(Delco ignition system)	VW	(Bosch/Fairchild ignition system)
General-Motors	(HEI-ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

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2. Test instructions

2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min^{-1} to 1200 min^{-1}).

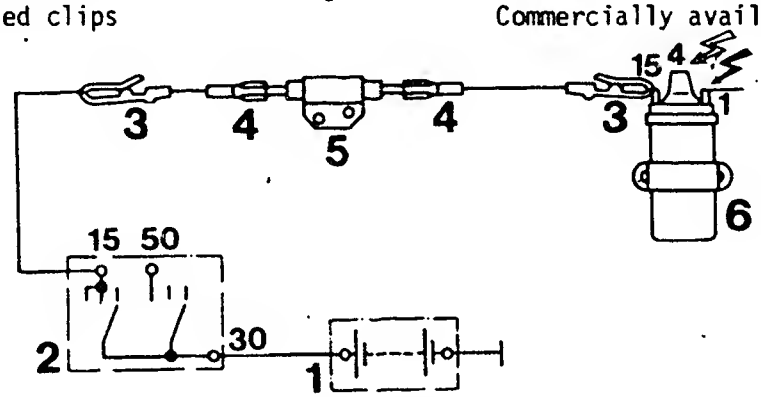
It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohm	Part No. 0 227 900 002
or	
1 ballast resistor 1.0 Ohm	Part No. 0 227 900 101
2 blade receptacles e.g.	Part No. 1 901 355 881
approx. 0.2 m cable, 1.5 mm^2 e.g.	Part No. 6 210 150 150
2 insulated clips	Commercially available



1 = Battery
2 = Ignition switch
3 = Clips
4 = Blade receptacle
5 = Ballast resistor
6 = Ignition coil

approx. 400 V

approx. 25 kV

2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.

After-sales Service

Motor Vehicle Service Information

MOTORTESTER CONVERSION
Incorrect display of rotational speed, dwell angle and ignition point only with trigger boxes 0 227 100 ... (TCI-i, TCI-h) with current limitation

VDT-I-Gen. 032 En
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268
268 S 10
269
214 B
AE 2000

1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

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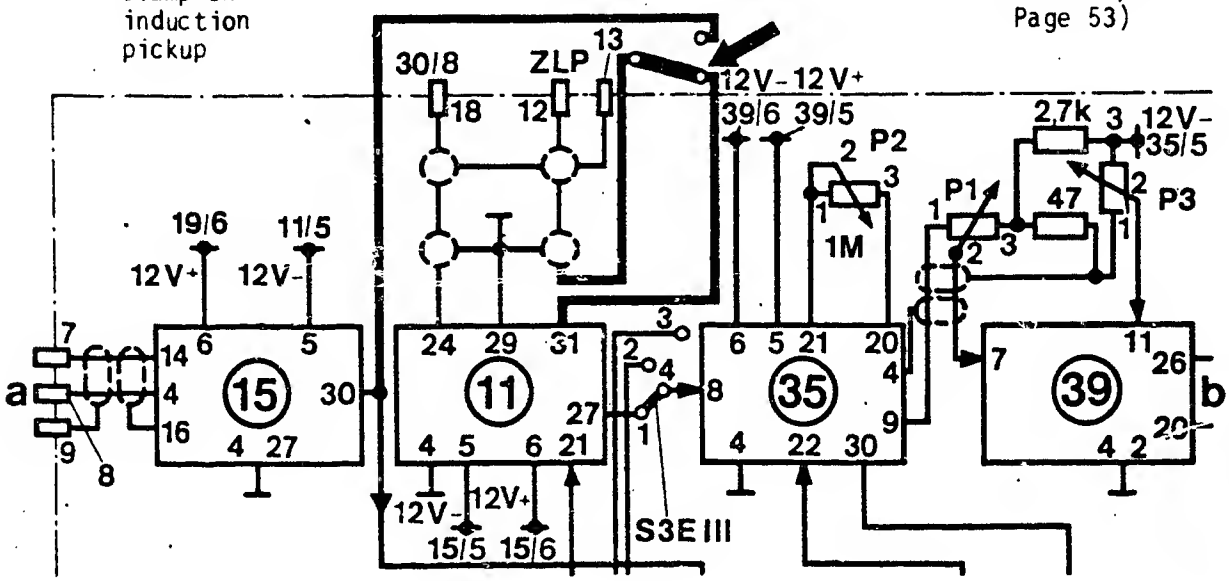
EFAW 268, 268 S 10, 269, AE 2000

Remove the line of the ZLP* from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.

* ZLP = timing light

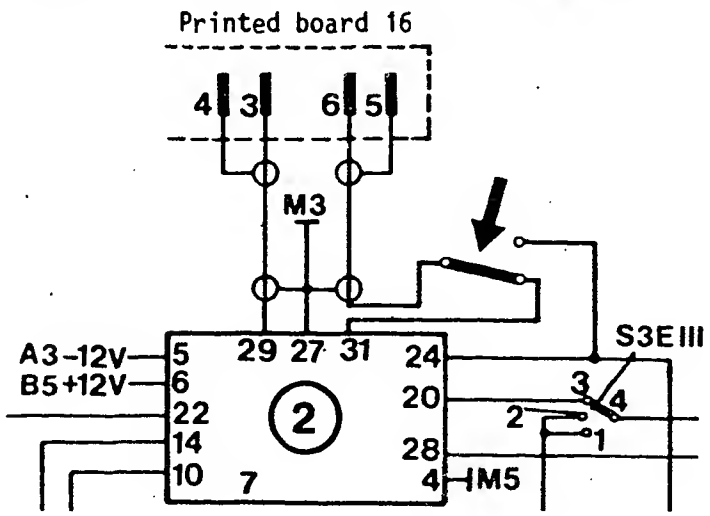
a = Clamp-on induction pickup

b = (Extract from WJF 508/1 Page 53)



EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.



(Extract from WJF 503/1, Page 64)

By fitting the switch with change-over contact in the front panel of the motor-tester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly: e.g. "standard" - "current limitation".
These conversion measures have already been published in the K7 information sheet KJF 28/7911.

4. Test instructions

4.1 Standard ignition systems

Switch position: "standard"
All other tester connections as per operating instructions.

4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

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Motor Vehicle Service Information

TESTS ON ELECTRONIC IGNITION SYSTEMS
(TCI, TZ)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph.:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

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